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ARSENOPYRITE TWINS FROM NEW MEXICO

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While looking over the property of the Romaho Mining Company in the Tres Hermanas Mountains of New Mexico, the writer found a number of arsenopyrite crystals, which seem to be worth recording, both because of their form, and of the fact that none have hitherto been noted from this locality.

The crystals occur in a fault zone in quartz porphyry, where the rock has been much altered by hydrothermal action, and converted into a material that resembles kaolin. The arsenopyrites are disseminated thru the clayey rock together with small crystals of pyrite, sphalerite, galenite and chalcopyrite, as well as grains of unaltered quartz.

The arsenopyrite forms either simple crystals or twins, the latter being either cruciform or star-shaped. The simple crystals are four to five millimeters long, with a width parallel to the macro-axis of a little more than half the length, thus showing an elongation parallel to the "c" axis. The habit of the crystals is very simple, consisting of the unit prism and basal pinacoid, no other forms being noted. While the individuals are well formed and show fairly smooth faces to the eye, a microscopic examination shows that the main surfaces are curved and irregular, due to vicinal planes. The interfacial angles vary somewhat from those usually given, the prism angle $m : m$ being $67^{\circ}5'$, and the macrodome angle, as determined from the twinning, being $57^{\circ}51'$. These facts bear out the statements of Goldschmidt¹ to the effect that in twinned crystals of arsenopyrite the forms are usually simple, and that the angles show a variation from the normal.

The twinning plane in all the crystals examined is parallel to the macrodome (101), and while the cruciform twins are common, the triplets are quite rare. A twin is shown in fig. 1, p. 86.

¹ Abstd. in *Am. Min.* 5 (2), 41, 1920.

A determination of the specific gravity gave a value of 5.88 which is somewhat low for arsenopyrite, but is probably due to the presence of included pyrite. Small crystals of the latter were found not only attached to some of the crystals of the former, but examination of a polished surface of the arsenopyrite crystals showed that these contained microscopic grains of pyrite.

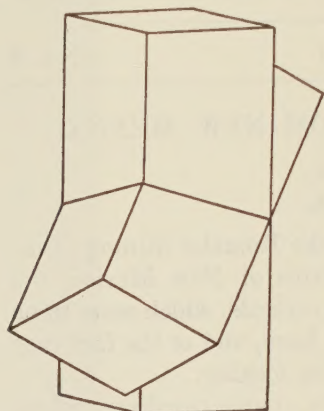


FIG. 1.

At first the crystals were suspected of being a copper mineral, since before the blowpipe they gave a strong copper reaction. An electrolytic determination on some crystals showed 0.2% of copper, while others showed none. A spectroscopic test, kindly

made for the writer by Dr. Papish, gave a strong copper line, indicating that this element was probably present, in the crystal examined, to the extent of 1%; (altho exact results cannot be obtained by this method). It appears, therefore, that the copper is present in variable amounts, no doubt due to inclusions of chalcopyrite. No other foreign element showed in the spectroscope. A complete analysis was not made because of the known inclusions of pyrite and the suspected inclusions of chalcopyrite, which it was impossible to separate.

THE IDENTITY OF "COLLBRANITE" WITH LUDWIGITE

EARL V. SHANNON¹

U. S. National Museum

The name collbranite was proposed by D. F. Higgins² for a mineral occurring in contact-metamorphosed limestone in the Suan Mining Concession in Central Korea. The following remarks are quoted from the original article:

¹ Published by permission of the Secretary of the Smithsonian Institution. [This mineral was included in the doubtful and discredited silicate list in our recent tabulation (6 (1), 17, 1921); it should be transferred to the borates, as shown in the present article. Ed.]

² Higgins, D. F., *Geology and Ore Deposits of the Collbran Contact of the Suan Mining Concession, Korea, Econ. Geol.*, 13, 19, 1918.

"There occurs very commonly in the marble walls of the ore-bodies of the mine, and in massive form in the western group, a black acicular mineral in characteristic stellar aggregates. This mineral has been referred to by Koto as ilvaite. In the unfortunate lack of a chemical analysis the identification of this mineral is doubtful. The writer believes, however, from microscopic evidence and from that of mineral association, that the mineral is not ilvaite, but a highly ferrous pyroxene of the hedenbergite type. There is a definite possibility that this mineral may be very close to the iron end of the isomorphous $(\text{Ca}, \text{Fe}) (\text{SiO}_3)_2$ series; if not indeed the terminal pyroxene, ferrous metasilicate, FeSiO_3 . He therefore proposes the name "collbranite" after Mr. H. Collbran and his son, Mr. A. H. Collbran, who have made the Suan mine a producer. This mineral will hereinafter be referred to as "collbranite."

In the publication by Koto³ which is cited the following description of this mineral is given:

"The ilvaite forms acicular radiating needles. It is opaque and submetallic appearing just like stibnite for which it has been taken. The cleavage toward (001) is distinct especially after partial solution. Before the blowpipe the ilvaite gives no reaction for sulphur but a reaction for manganese. On careful examination of thin needles the mineral turned out to be transparent breislakite-like emerald-green needles. Absorption pronounced; $c > a$ or b , a brown, c sap-green; and on account of strong absorption the needle becomes black in the latter direction. The optical character is positive. The refraction is high but the double refraction weak."

Since two observers had reached such widely divergent conclusions as to the identity of this mineral it was desirable that its identity be finally settled by analysis, especially since the name "collbranite" had entered the literature as indicating a new mineral species, yet with a unique lack of supporting evidence. Were it certainly of the composition assigned to it by Higgins the advisability of giving it a new name is open to question since the name ferrosilite, given to this compound by Iddings and Washington, was first published in 1903, and has been frequently used in the literature since that date. The investigation of the material has recently been undertaken in the Museum laboratory, the National Museum having received five or six excellent specimens of typical material from the Hol Gol (or Hol Kol) mine thru Mr. J. Morgan Clements. This material consists of black acicular radiating needles in an aggregate of calcite and diopside. Megascopically it agrees perfectly with the descriptions of both Higgins and Koto and its microscopic characters are as given by

³ Koto, B., *The Geology and Ore-deposits of the Hol Gol Gold Mine*, *J. Coll. Sci. Imp. Univ. Tokyo*, 27, art. 12, p. 11, 1910.

Koto. An analysis made upon material separated by heavy solutions gave: SiO_2 0.40, Fe_2O_3 32.49, Al_2O_3 2.32, B_2O_3 16.80, FeO 10.40, CaO 1.86, MnO 0.36, MgO 34.54, H_2O 1.42, sum 100.59%. This composition proves beyond question that the material is neither ilvaite nor a pyroxene, but that it is in fact ludwigite of not abnormal composition. That it should be mistaken for ilvaite under the microscope is not surprising since the optical properties of ludwigite and ilvaite are almost identical. How the mineral could have been mistaken for a pyroxene and what justification existed for assigning a new name to it is not clear. Such casual introduction of new names into a science already replete with meaningless words is greatly to be deplored. This ludwigite and its occurrence will be further reviewed in a paper on the distribution of ludwigite as a contact metamorphic mineral which is in preparation.

THE OLD COBALT MINE IN CHATHAM, CONN.

EARL V. SHANNON

U. S. National Museum

The old cobalt mine in Chatham is one of the many diverse types of metal deposit in New England which have in times past enticed speculative persons into spending money in their development without ever repaying the money invested, yet giving to mineralogical science numerous valuable specimens. The region about Cobalt was believed to contain rich mineral deposits from the earliest times. There is an old legend to the effect that Governor Winthrop was accustomed to repair to his mines here for a certain period of each year with a single henchman and to secretly mine, smelt and manufacture gold to supply himself for the balance of the year.

The cobalt mine was first worked in 1762 by three Germans who shipped the ore in casks to England, Holland, and China. Later another German named Erklens spent ten thousand dollars in development and shipped twenty tons of ore to China, but lost money on the venture. Seth Hunt, of New Hampshire, worked here from 1818 to 1820 and spent his fortune to no avail. Prof. C. U. Shepard operated the mine for a time about 1844. The last and most extensive operations were begun in 1850 when Edmund Brown sunk a shaft and ran drifts, taking out a large amount of ore and also building offices and reduction works.

There is no record of a purely scientific examination of the mine during its operation, and little is known regarding its production. Cobalt was the metal sought in all cases, it being converted into the oxide and used in the manufacture of smalt. A French chemist pronounced most of the ore from the shaft arsenical pyrite with 80 per cent. arsenic, 9 iron, $4\frac{1}{2}$ sulfur and 4 cobalt, and a trace of bismuth.¹

Dana lists from here the minerals arsenopyrite, smaltite, chloanthite (chathamite), scorodite, niccolite, and erythrite. "Chathamite," named for the locality, is an iron-rich chloanthite. The name is one of Shepard's. An analysis of this mineral by Genth gave: As 70.11, S 4.78, Co 3.82, Ni 9.44, Fe 11.85, sum 100 per cent.

The old mine is located at the south foot of Great or Cobalt Hill, about $1\frac{1}{2}$ km. (1 mile) north of Cobalt Station. It can be reached by taking the road which runs north from the station, to the road which runs east along the foot of Great Hill. The cobalt vein crosses the east-west road at three hundred and seventy paces from its intersection with the north-south road. The course of the vein is marked by a continuous line of deep trenches, now overgrown with bushes and trees, for almost 300 meters. Actual exposures of the ore in place there are none, but much rock from the openings is available for examination.

The vein seems to strike about due east-west and to dip with the inclosing rocks about 45° to the north. The most abundant rock is a dark sandy quartz gneiss containing thin laminas of coarser foliated biotite and garnet. The "chathamite" occurs in small grains, bunches and veinlets intergrown with the biotite in these biotite-rich layers. The blocks of this rock containing the cobalt minerals are stained greenish yellow on the outside and are rolled and crumpled. They are very tenacious and emit an arsenical or sulfurous odor when broken, even when no cobalt minerals are visible. Associated with the biotite-quartz gneiss is some silvery muscovite or sericite schist which contains no metallic minerals. In one place a small amount of a much altered basic igneous rock was seen. The vein seems to be merely a zone in the gneiss where the cobalt minerals occur in disseminated form. This zone contains quartz veins and lenses of two types. The first type is composed of granular quartz rendered schistose by thin parallel partings of mica, and

¹ Loomis, I. F., *The Town of Chatham, Conn., Quart.*, 5, 370, 1899.

contains no cobalt or other metallic minerals. The second type is coarsely crystalline white quartz, often translucent and containing abundant large crystalline grains and aggregates of "danaite." Where these bunches of cobaltiferous arsenopyrite are decomposed they yield earthy aggregates of a greenish yellow to gray color which may include scorodite and erythrite. No niccolite was found in the short time spent at the mine.

The buildings which were used in connection with the mining have vanished and such underground workings as were opened are also lost to sight. The dumps are still accessible, however, and yield abundant specimens of the above described minerals.

NOTES AND NEWS

It has been necessary to reduce the size of this number because many of our subscribers have not yet renewed, and members not paid their dues, and we are uncertain as to when they can be expected to do so. Subsequent numbers will be brought back to normal as soon as our income permits.

Corrections to List of Members of M. S. A.—Page 48 (February number), after V. W. Field add: Wylie G. Flack, 4418 N. 15th St., Philadelphia, Pa; 5th line from bottom, Mr. J. L. Wills should be transferred to page 50, 16th line.

Page 49, 10th line from bottom, Mr. M. W. Sensius should be Professor.

Minerals from York, Pa. M. L. Jandorf. The writer recently found in a local limestone quarry the following minerals, unusual for this region: barite, in colorless, pale greenish, golden wine-yellow, and white crystals; minute pyrite crystals in perfect cubes and modified, the latter type encrusting crystals of barite; deep purple fluorite; and transparent calcite crystals a few mm. in diameter, of almost perfect rhombohedral form. Unfortunately the number of specimens obtained is insufficient to permit them to be offered in exchange.

An apparatus for growing large crystals has recently been patented by Dr. Otto Dreibrodt, of Bitterfeld, Germany (U. S. Pat. 1,353,571, Sept. 21, 1920). The plan consists in circulating the liquid past the suspended growing crystal, and cooling the liquid on its way into the crystallizing vessel.

We regret to note the death of Dr. T. Wada, the eminent Japanese mineralogist and author of the *Mineralogy of Japan*, on December 20th, 1920; and of Sir Lazarus Fletcher, keeper of minerals and subsequently director of the British Natural History Museum, on January 6th, 1921. Biographic sketches of both will be published when space permits.

PROCEEDINGS OF SOCIETIES

The thirty-ninth regular meeting of the NEWARK MINERALOGICAL SOCIETY was called to order by Pres. Walther, with 11 members present, also 7 members of the New York Mineralogical Club, who had been invited to attend in a body. After the regular routine of business, Mr. Hoadley read a paper on "The More Unusual Minerals of N. J." Hydrophane, apatite, barite, opal, hyalite, and galenite were reported from Jersey City; sphalerite from Snake Hill; siderite, chalcopyrite, microcline, byssolite, gold, azurite, malachite, cuprite, native lead and silver were also mentioned.

Mr. Walther then read a paper on "Chemistry in Relation to Mineralogy" in which he said that most collectors did not know the symbols of the chemical elements, and advised such to study up on this matter. Proposals for membership were made by the secretary of Mr. J. A. Grenzig, of Brooklyn, and Mr. O. I. Lee, of Newark.

WM. H. BROADWELL, *Secretary*

PHILADELPHIA MINERALOGICAL SOCIETY

Academy of Natural Sciences, March 10, 1921

A stated meeting of the Philadelphia Mineralogical Society was held on the above date in its new quarters, the mineralogical laboratories of the Academy of Natural Sciences. The meeting room adjoins the magnificent Vaux Collection, above which is the Pennsylvania collection. The vice-president, Mr. Trudell, presided. Fifteen members were present.

Upon recommendation by the council the following were elected active members: Messrs. Witmer Stone, George Vaux, Jr., Frederick Hilbiber, and John Tallis. Mr. Warford nominated for membership Brother Lucian, of Lasalle College and Mr. Frank Oscar Eriksson. Upon similar recommendation a motion was made and passed that officers should not be exempted from paying dues. Mr. Warford moved that the committee on the publication of Mr. Gordon's "Mineralogy of Pennsylvania" be discharged with thanks, as the Academy of Natural Sciences had accepted the manuscript for publication. The motion was passed.

Mr. Samuel G. Gordon presented an abstract of a paper on "Desilicated granitic pegmatites," describing an abnormal group of pegmatites occurring exclusively in peridotites and serpentines and consisting entirely of albite (albitite), plagioclase and corundum (plumasite), or largely of corundum with other minerals. They are believed to owe their peculiarities to the reaction which occurred between the pegmatitic solutions and the peridotite or serpentine, which resulted in the desilication of the pegmatite and the development in the peridotite or serpentine of zones of biotite (altered since to vermiculite), chlorite, actinolite, and talc. Such an origin has been shown by Du Toit for the Natal plumasite, and a study of the Pennsylvania and Maryland albitites indicate a similar genetic history. The corundum deposits of Pelham, Mass., Chester, Mass., Georgia, and southwestern North Carolina present analogies which include them in this group. The North Carolina deposits have been held to be magmatic segregations in peridotites. The experimental results of Rankin on the system $MgO-Al_2O_3-SiO_2$ indicate that

corundum would not crystallize from a melt of the composition of peridotite, and there is therefore no evidence that magmatic segregations of corundum occur normally in the ultrabasic igneous rocks.

Mr. George Vaux, Jr., addressed the society on "The William S. Vaux Collection." William Sampson Vaux was born in Philadelphia, May 19, 1811, and died there May 5, 1882. When a boy he acquired a strong taste for mineralogy, perhaps thru his uncle, Joseph Sampson (1767-1826) who made probably the first mineral collection in America, which was later given to Haverford College. Mr. William S. Vaux made the magnificent collection which bears his name, having had many opportunities to acquire choice specimens on his numerous European trips, as well as fine things from the early American localities. The collection was bequeathed to the Academy of Natural Sciences, of which Mr. Vaux was vice-president.

The society then adjourned to the mineral hall for an examination of the collection. A case containing the latest acquisitions was exhibited in the rear of the meeting room.

SAMUEL G. GORDON, *Secretary*

NEW MINERALS

FAMILY 7. PHOSPHATES, ARSENATES, ETC.

SUBFAMILY 1. ARSENITES

TRIGONITE

GUST. FLINK: Trigonit och dixenit, två nya mineral från Långbanshytte Gruvor. (Trigonite and dixenite, two new minerals from the Långbanshyttan mines.) *Geol. Fören. Förh.*, 42(7), 436-452, 1920. [Swedish with English summary.]

NAME.—From the Greek *trigonos*, triangle, referring to the crystal habit.

PHYSICAL PROPERTIES

Color pale yellow to brownish; luster vitreous to adamantine. H. = 2 to 3; sp. gr. 8.28. Cleavage perfect on *b* (010), less perfect on *p* (101).

CRYSTALLOGRAPHIC PROPERTIES

Observed only in crystals, up to $\frac{1}{2}$ cm. in diameter, usually markedly triangular in outline.

Monoclinic, domatic. $a : b : c = 1.0740 : 1 : 1.6590$, $\beta = 91^\circ 31'$. Forms: $a(100)$, $b(\bar{1}00)$, $c(001)$, $d(00\bar{1})$, $e(010)$, $p(101)$, $q(\bar{1}0\bar{1})$, $r(10\bar{1})$, $s(\bar{1}01)$, $f(011)$, $g(012)$, $h(014)$, $i(01\bar{1})$, $m(110)$, $k(\bar{1}10)$, $l(210)$, $n(111)$, and $o(11\bar{1})$. The dominant forms are e , forming the base of the apparent triangular prism, and c , q and r forming the sides of the same (the plane of symmetry crossing the center of this prism).

OPTICAL PROPERTIES

$\alpha = 2.08$ and $\gamma = 2.16$, both ± 0.02 , determined by N. Alsén by immersion in mixtures of sulfur and selenium. Double refraction 0.06; optic axial plane $b(010)$; extinction angle in this plane 45° . Non-pleochroic.

CHEMICAL PROPERTIES

The mineral dissolves readily in dilute acids. Analysis was made on several small samples by Dr. R. Mauzelius, giving average values: As_2O_3 28.83, PbO 63.40, CaO 0.23, FeO 0.15, MnO 6.79, MgO 0.11, H_2O 0.81, Cl trace, insol. 0.13, sum 100.45%. The scarcity of the material prevented quantitative determination of the state of oxidation of the arsenic, but the indications point to the arsenious form. The formula derived is $\text{H}_2\text{O} \cdot 2\text{MnO} \cdot 6\text{PbO} \cdot 3\text{As}_2\text{O}_3$ or $\text{HMnPb}_3(\text{AsO}_3)_3$, which requires H_2O 0.9, MnO 6.7, PbO 64.0, and As_2O_3 28.4%.

OCCURRENCE

Found in 1919 at the 150 meter level in masses of dolomite, associated with native lead and several undetermined minerals.

DISCUSSION

This mineral is interesting as adding one to the very small group of minerals crystallizing in the monoclinic-domatic (clinohedral) class; it is noteworthy that one other representative of this class, tilasite, also occurs at Långban, and another, clinohedrite, in the similar deposit at Franklin Furnace, N. J.

[The species may be regarded as satisfactorily established, altho the formula is perhaps open to some modification. E. T. W.]

FAMILY 9. SILICATES

DOUBLE SILICATES WITH SULFATES, ARSENATES, ETC.

DIXENITE

GUST. FLINK, *paper above cited*.

NAME.—From Greek *di* = two and *xenos* = stranger, referring to the unique association of silica and arsenious oxide in a compound.

PHYSICAL PROPERTIES

Color nearly black, but intense red by transmitted light when in thin sheets. Luster metallic to resinous. $H. = 3$ to 4 ; sp. gr. = 4.20 . Cleavage basal, micaceous.

CRYSTALLOGRAPHIC PROPERTIES

Observed only as aggregates of thin flakes without crystal outlines. X-ray study shows the symmetry to be hexagonal or rhombohedral.

OPTICAL PROPERTIES

Mean $n = 1.96 \pm 0.02$. Under the microscope uniaxial and positive. Non-pleochroic.

CHEMICAL PROPERTIES

The mineral dissolves readily in HCl with the separation of gelatinous silica and in HNO_3 with evolution of brown fumes, indicating the As to be trivalent. Analysis by Mauzelius on a small amount of material gave:

As_2O_3 30.55, P_2O_5 0.09, SiO_2 8.66, CuO 3.38, FeO 4.54, MnO 48.94, MgO 0.50, CaO 0.28, H_2O 3.38, sum 100.32%. This corresponds to $4\text{RO} \cdot \text{SiO}_2 \cdot \text{As}_2\text{O}_3$, or, representing all the R by Mn and the water as hydroxyl, $(\text{MnOH})_2\text{Mn}_3(\text{SiO}_3)(\text{AsO}_3)_2$, which would require H_2O 2.8, MnO 56.2, SiO_2 9.6 and As_2O_3 31.4%.

OCCURRENCE

Found like the preceding mineral, but in hematite and serpentine as well as dolomite.

DISCUSSION

[May be regarded as established, except that the formula is somewhat uncertain. E. T. W.]

FAMILY 5. CARBONATES, BORATES, ETC.

SUBFAMILY 6. HYDROUS BORATES

PATERNOITE

F. MILLOSEVICH: Paternoite, un nuovo minerale del giacimento salifero di Monte Sambuco in territorio di Calascibetta, Sicilia. (Paternoite, a new mineral from the salt-bearing deposit at Mount Sambuco, Calascibetta, Sicily. *Rend. accad. Lincei, (phys., math. and nat. sci. class)*, 29, 286-289, 1920.

NAME: In honor of the eminent chemist, Emanuele Paternò.

PHYSICAL PROPERTIES

Color pure white; structure minutely granular; somewhat deliquescent. Sp. gr. 2.11. Under the microscope seen to be made up of minute crystalline laminas of rhombic outline, with acute angle about 62° , rarely truncated and hexagon-like.

OPTICAL PROPERTIES

Mean refractive index, by immersion method, about 1.475. Extinction symmetrical.

CHEMICAL PROPERTIES

Partially soluble in water, giving an alkaline reaction. Readily soluble in dilute acids. The material for analysis was dried at 100° , water lost below this temperature being considered hygroscopic, as the optical properties are constant up to this point. The boron was determined by Gooch's method, the water by the lead oxide method. The results were: B_2O_3 66.02, MgO 10.93, K_2O 1.08, Na_2O 0.36, Cl 2.35, SO_3 1.06, H_2O 19.16, sum less O = Cl 0.53, 100.43%.

The K and Cl are believed to be present as admixed carnallite, the Na and SO_3 as bloedite; on subtracting these, with the corresponding amounts of MgO and H_2O , the remainder is: B_2O_3 71.66, MgO 10.67, H_2O 17.67%, corresponding fairly closely to $MgO : 4B_2O_3 : 4H_2O$ or $H_8MgB_4O_{17}$ (theory B_2O_3 71.4, MgO 10.3, H_2O 18.3%).

OCCURRENCE

The occurrence of this material had been described by the same author in an earlier paper: Bloedite and other minerals from the salt-bearing deposit at Mount Sambuco, territory of Calascibetta, Sicily. (*Accad. Lincei*, 29, 344-347, 1920). The deposit contains besides kieserite, halite, etc., abundant bloedite in good crystals, of which detailed measurements and an analysis are given. In the bloedite-bearing beds there are numerous small rounded masses of the new mineral, which was at first thought to be boracite.

DISCUSSION

[This may provisionally be accepted as a new species, altho more complete optical data and an analysis of purer material would be desirable. In par-

ticular, the water content needs study, especially as to the rate of loss both below and above 100°. E. T. W.]

DISCREDITED SPECIES: "Collbranite"; see page 86.

ABSTRACTS—CRYSTALLOGRAPHY

THE PROBLEM OF CHEMICAL AFFINITY IN CRYSTALS AND THE VELOCITY OF CRYSTALLIZATION. M. PADOA. *Atti accad. Lincei*, **27**, II, 59-65; *Gazz. chim. Ital.* **48**, II, 139-147, 1918.

For abstract of this mathematical paper see *Chem. Abstr.* **13**, 1963-1964, 1919. E. T. W.

THE OPTICAL BEHAVIOR OF WATER OF HYDRATION. K. BRIEGER. *Ann. Physik*, **57**, 287-320, 1918.

For abstract of this physical paper see *Sci. Abstr.* **22a**, 111; *Chem. Abstr.* **13**, 3076-3077, 1919. E. T. W.

METHOD OF OBTAINING AN OPTICAL STUDY OF CRYSTALS OF SODIUM CHROMATE TETRAHYDRATE. LUCIEN DELHAYE. *Bull. soc. franc. min.* **41**, 80-92, 1918.

Directions are given for crystallizing this salt. Its optical properties have been determined in detail. E. T. W.

DISTRIBUTION OF TWO KINDS OF ATOMS IN THE REGULAR FRANKENHEIM-BRAVAIS SPACE LATTICES. G. TAMMANN. *Nachr. Ges. Wiss. Göttingen*, **1918**, 190-234.

ATOMIC STRUCTURES OF NON-METALLIC MIXED CRYSTALS. The same, pp. 296-318.

ISOMERIC ALLOYS. pp. 332-350.

ALTERATION IN THE CHEMICAL BEHAVIOR OF METALS AND THEIR MIXED CRYSTALS BY MECHANICAL WORKING. pp. 351-361.

For abstracts of these papers on crystal structure see *Chem. Abstr.*, **14** (6), 668-671, 1920. E. T. W.

PYROMORPHITE FROM HORCAJO, CIUDAD-REAL, SPAIN. F. PARDILLO AND F. GIL. *Mem. R. Soc. españ. Hist. Nat.*, **10**, No. 6a, 30 pp. and 5 plates, 1916; thru *Rev. Géol.*, **1** (3), 75, 1920.

The specimens are among the most beautiful minerals of Spain. The forms found on 51 crystals are described, of which the following are new: (6067), (905.10), (6085), (9057), (4043), (7075), (3032), (8085), (5053) and (7074); many rare, doubtful, and vicinal forms were also present. Three new twinning laws were observed. E. T. W.

STUDIES ON THE GROUPINGS OF BORAX. M. SAN MIGUEL and M. DE J. NARANJO Y VEGA. *Publ. Secc. Cienc. Nat. Univ. Barcelona*, **1918**, 21-34, 14 figs.; thru *Rev. Géol.*, **1** (3), 75, 1920.

Two new twinning laws, on (221) and (331), as well as several groupings, are described. These are discussed in accordance with the Goldschmidt theories. E. T. W.

USE OF PLATES NORMAL TO THE MEAN INDEX AND TO AN OPTIC AXIS IN THE DETERMINATION OF PLAGIOCLASES. G. CÈSARO. *Bull. soc. franc. min.* **39**, 30-63, 1916.

CERUSSITE FROM SALMO, B. C. A. LEDOUX and T. L. WALKER. *Ottawa Naturalist*, **32**, 7-8 (1918); thru *Min. Abstr.*, **19**, 6 (1920).

Occasionally clear crystals of cerussite are found with the oxidized zinc ores of the H. B. mine. Twenty-four crystal forms were noted, including two new brachydomes, (092) and (0.12.1). Twinning was also noted parallel to the prisms (110) and (130). W. F. HUNT

THE CRYSTAL STRUCTURE OF CARBORUNDUM. A. W. HULL. *Phys. Rev.*, **13**, 292-295, 1919.

Discussion of paper by Burdick and Owen, abstd. in *Am. Min.*, **4** (11), 148, 1919. A different arrangement of the atoms and electrons is suggested. E. T. W.

A CRYSTALLOGRAPHIC STUDY OF CALCITE AND BARITE FROM LÅNGBANSHYTAN. G. AMINOFF. *Geol. För. Förh.*, **40**, 273-446, 1918; APPENDIX 1, FLUORITE, 436-440; APPENDIX 2, TILASITE, 441-444; thru *Min. Abstr.*, **1**, 71, 1920.

Sixteen types of calcite crystals showed 78 forms, of which 24 are new. The minerals associated with each type and order of crystallization, curvature of faces, corrosion and growth phenomena, and influence of original solution on the habit of crystals are also discussed. The barite crystals were of 7 types. Two new forms, (520), (1.1.11) were recorded, among the 31 forms present. On fluorite 8 forms were noted, of which three, (119), (1.3.14), (043) are new. The tilasite occurs as bundles of small tabular crystals, all twinned on (100). The forms are (010), ($\bar{1}$ 10), ($\bar{1}$ 31), ($\bar{1}$ 12), ($\bar{1}$ 1 $\bar{1}$), ($\bar{1}$ 01), the last three being new. W. F. HUNT

INVESTIGATIONS BY MEANS OF X-RAYS OF THE CRYSTAL STRUCTURE OF WHITE AND GRAY TIN. A. J. BIJL AND N. H. KOLKMEIJER. *Proc. Acad. Sci. Amsterdam*, **21**, 494-504, 1919; thru *Chem. Abstr.*, **13** (21), 2635, 1919.

Continuation of work abstd. in *Am. Min.* **5** (1), 19, 1920. E. T. W.

MAGNESIUM POTASSIUM CHROMATE HEXAHYDRATE. A. DUFFOUR. *Compt. rend.*, **169**, 73-76, 1919.

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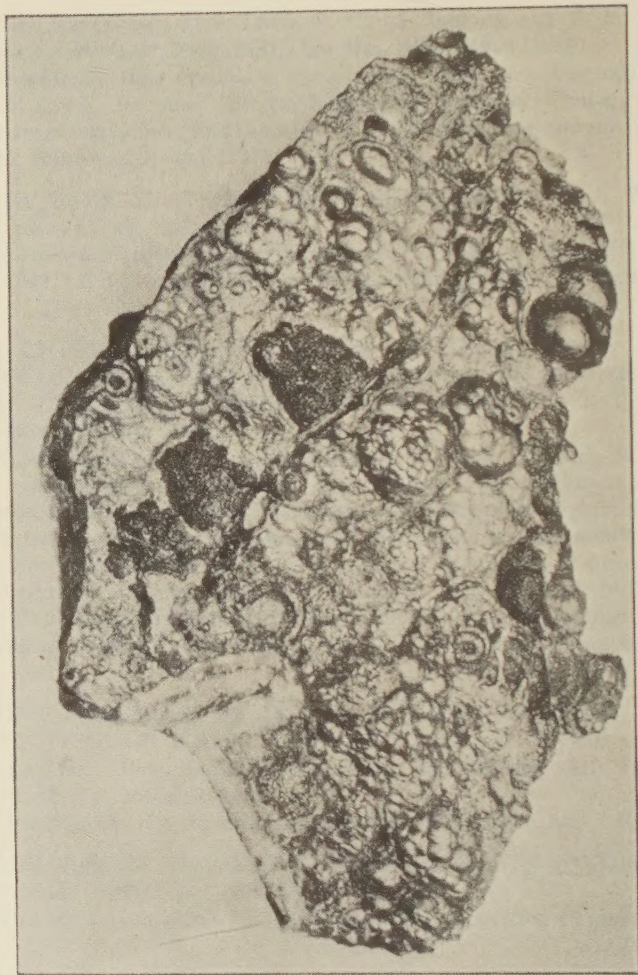
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PLATE 5



"ALLEMONTITE," ATLIN, B. C.

($\times 1$)